1   **In the Claims:**

2   1.   A switching center for a communications system that provides

3   communications services to customers having wireless and other communications

4   devices, comprising:

5   a first interface, the first interface receiving and sending digital messaging

6   having a first protocol;

7   a second interface, the second interface receiving and sending digital

8   messaging having a second protocol; and

9   a processor system coupled to the first and the second interfaces, wherein the

10   processor system controls operation of the first and the second interfaces and

11   generates control messages for sending by the first and the second interfaces.

12   2.   The switching center of claim 1, wherein the first interfaces comprises:

13   a first intrasystem message handler; and

14   a first intersystem message handler, and wherein the second interface

15   comprises:

16   a second intrasystem message handler; and

17   a second intersystem message handler.

18   3.   The switching center of claim 2, wherein the first intrasystem message handler

19   operates according to IS-634 protocols, the second intrasystem and intersystem

20   message handlers operate according to GSM protocols, and the first intersystem

21   message handler operates according to IS-41 protocols.

22   4.   The switching center of claim 3, wherein the GSM protocols include GSM A

23   (Series 4 and 8) protocols, IS-651 and J-STD protocols, IS-652 protocols and GSM

24   09.02 protocols.

25   5.   The switching center of claim 3, wherein the IS-634 and the IS-41 protocols

26   include time division multiple access (TDMA) protocols and code division multiple

27   access (CDMA) protocols and AMPS protocols.

1   6.   The switching center of claim 1, wherein the first interface further receives and

2   sends analog messaging, the analog messaging including Advanced Mobile Telephone

3   System (AMPS) protocols.

4   7.   The switching center of claim 6, wherein the AMPS protocols include IS-634

5   protocols and ISDN PRI+ protocols and proprietary protocols.

6   8.   The switching center of claim 1, further comprising:

7   a home location register coupled to the processor system; and

8   a visitor location register coupled to the home location register and the

9   processor system, wherein the home location register stores permanent data related to

10   customers of the communications system that are homed on the communications

11   system, and wherein the visitor location register stores temporary data related to

12   customers that are active on the communications system, the home location register

13   and the visitor location register indicating a most recent protocol used by a wireless

14   communications device of a customer and indicating other protocols useable by the

15   wireless communications device.

16   9.   The switching center of claim 8, wherein the permanent data related to

17   customers in the home location register is stored in a customer profile, the customer

18   profile including one or more of call features, call restrictions, mobile unit protocols,

19   line identification, personal identification number, call offering, prepaid services and

20   customer information.

21   10.   The switching center of claim 8, wherein the home location register includes a

22   common data section and protocol-specific data sections, wherein the common data

23   section stores data generic to all protocols and the protocol-specific data sections

24   stores data unique to one or more specific protocols.

25   11.   The switching center of claim 8, wherein the processor system determines a

26   protocol of a wireless communications device by reference to one of the home

27   location register and the visitor location register.

28   12.   The switching center of claim 1, wherein the communications system includes

29   one or more base stations, and wherein the processor system determines a protocol of

1   a wireless communications device based on a protocol of the base station that

2   communicates between the switching center and the wireless communications device.

3   13.   The switching center of claim 1, wherein the communications system includes

4   a multi-protocol base station, the multi-protocol base station sending base station

5   control messages to the switching center, and wherein the processor system

6   determines a protocol of a wireless communications device by interpreting protocol

7   data contained in the base station control message.

8   14.   The switching center of claim 1, wherein the communications system receives

9   communications from an external wireless system having an external home location

10   register and an external communications device registered on the external home

11   location register, and wherein the processor system determines a protocol of the

12   external communications device by obtaining an identification of the external home

13   location register.

14   15.   The switching center of claim 1, wherein the processor system generates and

15   interprets generic command messages, the generic command messages operable to

16   control the communications services according to at least the first and the second

17   protocols.

18   16.   The switching center of claim 1, wherein the processor system generates and

19   interprets protocol-specific command messages, the protocol-specific command

20   messages used to provide additional control of the communications services.

21   17.   The switching center of claim 1, further comprising an asynchronous transfer

22   mode (ATM) interface, the ATM interface providing wireless ATM communications

23   and other packet board communications.

24   18.   The switching center of claim 1, further comprising a public switched

25   telephone network (PSTN) interface.

26   19.   The switching center of claim 1, further comprising a private branch exchange

27   (PBX) interface.

1   20.   The switching center of claim 1, wherein the wireless communications devices

2   include a fixed wireless telephone, a mobile telephone and a computer having a

3   wireless modem.

4   21.   The switching center of claim 1, further comprising:

5   an equipment identification register, wherein the equipment identification

6   register includes serial number data related to the mobile communications devices that

7   are homed on the wireless communications system; and

8   an authentication center, wherein the authentication center provides

9   authentication and encryption parameters for wireless communications received at and

10   originated from the switching center.

11   22.   The switching center of claim 1, further comprising:

12   a first device handler coupled to the first interface; and

13   a second device handler coupled to the second interface, wherein the first and

14   the second device handlers are operable to receive and transmit multi-protocol

15   messaging from and to devices external to the switching center and to transmit and

16   receive generic messaging to and from the first and the second interfaces, respectively.

17   23.   The switching center of claim 1, wherein the processing system comprises:

18   a central processor, the central processor controlling operation of the processor

19   system;

20   an authentication and registration system, the authentication and registration

21   system controlling registration of the wireless communications devices with the

22   communications system and providing encryption and ciphering of voice and data

23   communications;

24   a paging system, the paging system sending paging messages to the wireless

25   communications devices and receiving page response messages from the wireless

26   communications devices;

27   a timer system, the timer system setting timers in response to operations of the

28   processing system;

1   a recovery and startup system, the recovery and startup system managing a

2   status of communications trunks in the communications system and performing audits

3   of the communications system; and

4   a memory, wherein the memory stores information related to a particular call

5   in a memory area, and wherein components of the processor system access the

6   memory area to retrieve and store information related to the particular call.

7   24.   The switching center of claim 23, wherein the processor system further

8   comprises a hand off processor, the hand off processor receiving and processing hand

9   off requests from a wireless communications device in the communications system,

10   determining a target base station for hand off and sending a hand off command to the

11   wireless communications device.

12   25.   The switching center of claim 23, wherein the processor system operates to

13   reserve a voice channel with each base station in the communications system that is

14   capable of receiving communications from the wireless communications device, and

15   wherein the processor system operates to release all base stations having a reserved

16   voice channel, except the target base station, upon receipt by the processor system of a

17   call connect acknowledge message.

18   26.   The switching center of claim 1, further comprising a graphical user interface,

19   the graphical user interface providing an operator access to operate the switching

20   center and to update data related to the customers, database configuration, system

21   configuration and maintenance.

22   27.   A mobile switching center, comprising:

         a central processor that processes incoming signals, wherein the incoming

24   signals are switched in a telecommunications network; and

25   a wireless interface module that supports two or more wireless protocols.

26   28.   The mobile switching center of claim 27, further comprising a switch

27   management module that manages the switching of the incoming signals.

28   29.   The mobile switching center of claim 27, wherein the wireless interface

29   module comprises a digital interface that supports digital wireless communications.

1   30.   The mobile switching center of claim 27, wherein the wireless interface

2   module comprises an analog interface that supports analog wireless communications.

3   31.   The mobile switching center of claim 27, wherein the wireless interface

4   module comprises a GSM interface that supports GSM protocol wireless

5   communications.

6   32.   The mobile switching center of claim 27, wherein the wireless interface

7   module comprises a TDMA interface that supports TDMA protocol wireless

8   communications.

9   33.   The mobile switching center of claim 27, wherein the wireless interface

10   module comprises a CDMA interface that supports CDMA protocol wireless

11   communications.

12   34.   The mobile switching center of claim 27, wherein the wireless interface

13   module comprises a AMPS interface that supports AMPS protocol wireless

14   communications.

15   35.   The mobile switching center of claim 27, wherein the wireless interface

16   module comprises a DAMPS interface that supports DAMPS protocol wireless

17   communications.

18   36.   The mobile switching center of claim 27, further comprising a visitor location

19   register that stores information about visiting switch users.

20   37.   The mobile switching center of claim 27, further comprising a home location

21   register that stores information about home switch users.

22   38.   The mobile switching center of claim 27, further comprising a wired interface

23   module that provides connections to wired land-lines.

24   39.   The mobile switching center of claim 27, further comprising a graphical user

25   interface that allows an operator to operate the mobile switching center.

26   40.   The mobile switching center of claim 39, wherein the graphical user interface

27   is remotely located from the mobile switching center.

1   41.   The mobile switching center of claim 27, further comprising an equipment

2   identification register which stores information identifying equipment used with the

3   mobile switching center.

4   42.   The mobile switching center of claim 27, further comprising a prepaid module

5   that enables prepaid communication.

6   43.   The mobile switching center of claim 27, further comprising a features module

7   that supports a plurality of communication features.

8   44.   The mobile switching center of claim 27, further comprising a remote network

9   management access module that is remotely located from and operably connected to

10   the mobile switching center.

11   45.   The mobile switching center of claim 27, further comprising an authentication

12   center that authenticates incoming signals.

13   46.   An advanced intelligent message handler for use in a mobile

14   telecommunications network having mobile communications devices and one or more

15   base stations, the advanced intelligent message handler, comprising:

16   a first interface for intersystem messaging, the first interface, comprising:

17   a first GSM processing thread,

18   a first TDMA processing thread,

19   a first CDMA processing thread, and

20   a first AMPS processing thread;

21   a second interface for intrasystem messaging, the second interface, comprising:

22   a second GSM processing thread,

23   a second TDMA processing thread,

24   a second CDMA processing thread, and

25   a second AMPS processing thread; and

26   a processor system coupled to the first and the second interfaces, the processor

27   system controlling a flow of message traffic to and from the first and the second

28   interfaces.

47.   A method for controlling communications in a multi-protocol wireless network, comprising:

receiving first digital communications according to a first protocol at a first interface;

sending a first control message according to the first protocol;

receiving second digital communications according to a second protocol at a second interface; and

sending a second control message according to the second protocol, wherein a processor in a switching center interprets the first and the second digital communications and generates the first and the second control messages.

48.   The method of claim 47, further comprising;

receiving intrasystem communications at a intrasystem message handler; and

receiving intersystem communications at a intersystem message handler.

49.   The method of claim 48, wherein the intrasystem message handler operates according to IS-634 and GSM standards and the intersystem message handler operates according to IS-41 and GSM standards.

50.   The method of claim 49, wherein the GSM protocols include GSM A protocols, IS-651 protocols, IS-652 protocols and GSM 09.02 protocols.

51.   The method of claim 49, wherein the IS-634 and IS-41 protocols include time division multiple access (TDMA) protocols and code division multiple access (CDMA) protocols and AMP protocols.

52.   The method of claim 47, wherein the first interface further receives and sends analog communications, the analog communications including Advanced Mobile Telephone System (AMPS) protocols.

53.   The method of claim 52, wherein the AMPS protocols include IS-634 protocols and ISDN PRI+ protocols and proprietary protocols.

54.   The method of claim 47, further comprising:

creating a home location register, the home location register including a customer profile for each mobile unit in the multi-protocol wireless network, the

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1   customer profile indicating protocols available to the mobile and a most recent

2   protocol used by the mobile unit; and

3   creating a visitor location register, the visitor location register containing the

4   customer profile for each mobile unit that is active in the multi-protocol wireless

5   network.

6   55.   The method of claim 54, wherein the customer profile further includes call

7   features, call restriction, line identification, personal identification number, call

8   offering and prepaid services.

9   56.   The method of claim 54, wherein the home location register includes a

10   common data section and a protocol-specific data section, the common data section

11   storing data generic to all protocols and the protocol-specific data sections storing data

12   unique to one or more protocols.

13   57.   The method of claim 54, further comprising determining a protocol of a

14   wireless communications device by reference to one of the home location register and

15   the visitor location register.

16   58.   The method of claim 47, further comprising determining a protocol of a

17   wireless communications device by reference to a protocol of a base station that

18   communicates with the switching center.

19   59.   The method of claim 47, wherein the multi-protocol wireless network includes

20   one or more multi-protocol base stations, wherein the processor determines a protocol

21   of a wireless communications device by interpreting protocol data contained in

22   communications from the one or more multi-protocol base stations.

23   60.   The method of claim 47, further comprising:

24   receiving communications from an external communications device from a

25   wireless network external to the multi-protocol wireless network, the external wireless

26   network including an external home location register; and

27   determining a protocol of the external communications device by obtaining an

28   identification of the external home location register.

61. The method of claim 47, wherein the processor generates and interprets generic messages, the generic messages providing generic control signals to control operation of the multi-protocol wireless network.

62. The method of claim 47, wherein the processor generates and interprets protocol-specific messages, the protocol-specific messages providing additional control of the communications devices.

63. The method of claim 47, further comprising providing packet based communications.

64. The method of claim 63, further comprising providing an asynchronous transfer mode (ATM) interface providing wireless ATM communications.

65. The method of claim 64, wherein the ATM interface provides PSTN connectivity and an extension of a switch matrix.

66. The method of claim 47, further comprising connecting the switching center to a public switched telephone network (PSTN).

67. The method of claim 47, further comprising connecting the switching center to a private branch exchange.

68. The method of claim 47, wherein the communications devices include a fixed wireless telephone, a mobile telephone and a computer having a wireless modem.

69. The method of claim 47, further comprising:

recording an identity of a mobile device; and

encrypting and decrypting the first and the second digital communications.

70. The method of claim 47, further comprising:

receiving first communications at and sending first communications from a first device handler coupled to the first interface; and

receiving second communications at and sending second communications from a second device handler coupled to the second interface, wherein the first and the second device handlers are operable to receive and transmit multi-protocol communications.

71. The method of claim 47, further comprising:

1   sending and receiving registration notification messages to register a mobile

2   unit in a visitor location register;

3   sending and receiving paging messages to access a mobile unit in the multi-

4   protocol wireless network;

5   setting a timer to time out control messages;

6   maintaining a status of communications trunks in the multi-protocol wireless

7   network; and

8   storing data related to a particular call in a common memory area, the data for

9   the particular call used by components of the multi-purpose wireless network to

10   control and access the particular call.

11   72.   The method of claim 47, further comprising;

12   monitoring a signal strength of communications with a mobile

13   communications device;

14   sending a hand off request when the signal strength exceed a limit;

15   measuring signal-strengths of each of the other base stations in the multi-

16   protocol wireless network;

17   reserving a voice channel in each of the other base stations; and

18   selecting a target base station for communication with the mobile

19   communications device; and

20   handing off the mobile communications based on the measurements.

21   73.   The method of claim 47, further comprising providing a graphical user

22   interface to the switching center, the graphical user interface allowing an operator to

23   update information stored by the switching center.

24   74.   The method of claim 47, further comprising;

25   designating a first communications trunk, the first communications trunk

26   carrying the first control message, wherein the first communications trunk connects a

27   ~~first base station and the switching center; and~~

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1   designating a second communications trunk, the second communications trunk

2   carrying the second control message, wherein the second communications trunk

3   connects a second base station and the switching center.

4   75.   The method of claim 47, wherein the switching center comprises a plurality of

5   communications trunks, the switching center designating one or more of the plurality

6   of the communications trunks for use in connecting wireless calls.

7   76.   The method of claim 75, wherein the switching center tracks a state of each

8   communications trunk of the plurality of communications trunks.

9   77.   The method of claim 76, wherein a state of a communications trunk may be

10   one of not configured, blocked, unblocked, unblocked pending, call processing,

11   blocked pending and maintenance.

12   78.   The method of claim 77, wherein the communications trunk transitions from

13   the not configured state to the blocked state when a base station is activated in the

14   wireless network.

15   79.   The method of claim 77, wherein the communications trunk transitions from

16   the blocked state to the unblocked pending state based on a recovery request.

17   80.   The method of claim 77, wherein the communications trunk transitions from

18   the unblocked state to the call processing state when a base station is allocated for call

19   processing.

20   81.   The method of claim 47, further comprising:

21   receiving a call from a prepaid customer;

22   processing the call from the prepaid customer;

23   determining an allowed time of call based on a prepaid account for the prepaid

24   customer;

25   determining a warning time for the call, wherein the warning time is a time

26   less than the allowed time;

27   connecting the call;

28   monitoring a time of the call;

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1   providing a warning to the prepaid customer when the warning time occurs;

2   and

3   disconnecting the call when the allowed time is reached.

4   82.   The method of claim 81, further comprising

5   providing a plurality of rate plans, wherein the prepaid customer may select a

6   desired rate plan from the plurality of rate plans.

7   83.   The method of claim 82, wherein the desired rate plan is stored in a home

8   location register.

9   84.   The method of claim 81, further comprising

10   determining a least cost route for the call from the prepaid customer.

11   85.   The method of claim 81, further comprising:

12   at a completion of the call from the prepaid customer, computing an actual

13   cost for the call; and

14   updating the prepaid account, based on the actual cost for the call.

15   86.   A graphical user interface (GUI) for use with a scalable, wireless switching

16   center, comprising:

17   a home location register (HLR) GUI hierarchy;

18   a visitor location register (VLR) GUI hierarchy;

19   a database management GUI hierarchy;

20   a system configuration GUI hierarchy; and

21   a call record manager GUI hierarchy, wherein GUIs provide access to data that

22   controls operation of the switching center.

23   87.   The GUI of claim 86, further comprising a rate plan hierarchy GUI.

24   88.   The GUI of claim 86, wherein the HLR GUI hierarchy comprises:

25   a password GUI;

26   a HLR access GUI; and

27   protocol-specific HLR GUIs, wherein the HLR access GUI lists subscribers to

28   a network serviced by the switching center.

1   89.   The GUI of claim 88, wherein the protocol-specific HLR GUIs include one of

2   GSM, CDMA TDMA, AMPS, multiple-protocol and prepaid.

3   90.   The GUI of claim 88, wherein the protocol-specific HLR GUIs comprise a

4   subscriber profile GUI.

5   91.   The GUI of claim 90, wherein the subscriber profile GUI includes:

6   a subscriber definition window;

7   a call offering window;

8   a protocol window;

9   a call restriction window;

10   a call feature window;

11   a line identification window; and

12   an add, modify, delete window that allows a subscriber's profile to be updated.

13   92.   The GUI of claim 86, wherein the VLR GUI hierarchy comprises:

14   a password GUI;

15   a VLR access GUI; and

16   protocol-specific VLR GUIs, wherein the VLR access GUI lists subscribers

17   active on a network serviced by the switching center.

18   93.   The GUI of claim 82, wherein the protocol-specific VLR GUIs include one of

19   GSM, CDMA, TDMA, AMPS, multiple-protocol and prepaid.

20   94.   The GUI of claim 92, wherein the protocol-specific VLR GUIs comprise a

21   subscriber profile GUI.

22   95.   The GUI of claim 94, wherein the subscriber profile GUI includes:

23   a subscriber definition window;

24   a call offering window;

25   a protocol window;

26   a call restriction window;

27   a call feature window;

28   a line identification window;

29   ~~a call feature window;~~ and

1   an add, modify, delete window that allows a subscriber profile to be updated.

2   96.   the GUI of claim 86, wherein the system configuration GUI hierarchy,

3   comprises:

4   a trunk maintenance GUI, the trunk maintenance GUI including:

5   a span and channel selection, and

6   a change channel state selection.

7   97.   The GUI of claim 86, wherein the system configuration GUI hierarchy,

8   comprises:

9   a board configuration including a modify module that allows a board to be

10   reconfigured.

11   98.   The GUI of claim 97, wherein the board includes one of a T-1/E-1 board, a

12   voice I/O board, a conference board and a SS-7 board.

13   99.   The GUI of claim 86, wherein the call record GUI includes an archived data

14   window.

15   100.   The GUI of claim 86, wherein the call record GUI includes an output selection

16   GUI, the output selection GUI providing one of a display selection, a printer selection,

17   no selection and other output selection.

18   101.   The GUI of claim 86, wherein the call record GUI includes an auto-removal

19   GUI, the auto-removal GUI including a number of days before removing archived

20   files selection.

21   102.   The GUI of claim 87, wherein the rate plan hierarchy GUI, comprises:

22   a rating administration tab, the rating administration tab displaying a list of

23   distributors;

24   a distributor data GUI;

25   a modify distributor data GUI; and

26   a modify rate plan GUI.

27   103.   The GUI of claim 102, wherein the rate plan hierarchy GUI further comprises

28   a modify prepaid entry GUI.

29   104.   The GUI of claim 103, wherein the prepaid entry GUI, comprises:

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1   a balance window;

2   a rate information window;

3   a payment method window; and

4   an other features window.